REMARKS

By this amendment, claim 8 is revised and arguments are presented to place the application in condition for allowance. Currently, claims 8-11, 24, and 25 are before the Examiner for consideration on their merits.

First, the potassium recited in claim 8 is now limited to potassium tetraborate. No new matter is introduced by this amendment since this compound is disclosed on page 6, line 18, of the specification.

Applicants submit that as a result of the revision to claim 8 and the arguments made herein, the rejection is no longer appropriate and must be withdrawn.

In the outstanding office action, a new rejection was made using newly-cited United States Patent No. 4,529,451 to Otrhalek and combining it with previously-cited Boulos and newly-cited United States Patent No. 4,474,651 to Yauchi. In making the rejection, the Examiner alleges that Otrhalek teaches the method of claim 8 except for the use of potassium and application of the method to 0.5-13% Cr pipe. Boulos is cited to allege that it would be obvious to use potassium hydroxide to adjust the free and total acid content of the coating solution of Otrhalek. Yauchi is used to allege that it would be obvious to apply the method of Otrhalek, as modified by Boulos, to 0.5-13% Cr pipe given Yauchi.

The Examiner makes a second rejection similar to the one using Boulos. In the second rejection, United States Patent No. 4,486,241 to Donofrio is used in place of Boulos to reject the claims. That is, the Examiner cites Donofrio to allege that

potassium hydroxide can be used for pH adjustment and that it would be obvious to employ this potassium in the conversion liquid.

Finally, the Examiner rejects claim 8 under 35 USC §103 based on the combination of JP 2001-335956 (JP '956) and Boulos. Here, the Examiner admits that JP '956 does not teach the addition of potassium and turns to Boulos to allege that it would be obvious to add potassium hydroxide to the chemical conversion liquid of JP '956.

The traverse of the rejection is made below using the headings of INVENTION and ARGUMENTS.

INVENTION

As specified in claim 8, the present invention relates to a method of manufacturing an oil well pipe. A chemical conversion film formed on the surface of a connecting portion of an oil well pipe must be free of lack of hiding so as to prevent the connecting portion from galling after multiple iterations of tightening and loosening. Namely, the term "oil well pipe" set forth in claim 8 specifies that the claimed method is a method of forming a chemical conversion film free of lack of hiding. A lack of hiding, as explained in paragraph [0032] of Applicants' published patent application refers to an exposure of the pipe metal beneath the protective coating applied thereon. If there is a lack of hiding or exposed metal, the joint can be compromised in a number of ways.

A steel member which is a substrate of the oil well pipe according to the present invention has a composition comprising 0.5-13% of Cr, as specified in claim 8. Such a member is referred to below as a Cr-containing steel substrate.

When a Cr-containing steel substrate contacts a conventional chemical conversion treatment liquid, ordinary reactions of the liquid in which zinc phosphate or manganese phosphate is deposited as a counter reaction to a reaction of eroding a Cr-containing steel substrate do not proceed because a Cr-containing steel substrate has an oxide of chromium on its surface. Instead of forming zinc phosphate or manganese phosphate, iron phosphate is formed and deposited on the surface of the Cr-containing steel substrate. Once iron phosphate is deposited on the surface of the Cr-containing steel substrate, zinc phosphate or manganese phosphate cannot be deposited on iron phosphate and the region on which iron phosphate is deposited develops lack of hiding.

Namely, as far as a conventional chemical conversion treatment liquid is employed, a chemical conversion film which meets the demands of a chemical conversion film on an oil well pipe cannot be formed on a steel member having a composition comprising 0.5-13% of Cr.

One object of the present invention is to resolve this problem and to provide chemical conversion treatment for an oil well pipe formed of a Cr-containing steel substrate (page 2, line 23 to page 3, line 1 of the present specification).

The present invention has an advantageous effect such that a chemical conversion film without lack of hiding, namely a proper chemical conversion film,

is formed on a Cr-containing steel substrate. This advantageous effect is obtained since the present invention contains the multiple features that a chemical conversion treatment liquid contains a zinc ion or a manganese ion, a phosphate ion, and potassium tetraborate, that the liquid is free of fluoride ions, and that a substrate on which a chemical conversion film is formed is a Cr-containing steel substrate.

As described on page 6, lines 23 to 30 of the present specification, it is thought that a floating insoluble gel (floating material) is formed on the surface of a steel substrate because of the existence of potassium tetraborate in the chemical conversion treatment liquid, and that a deposition reaction of zinc phosphate or manganese phosphate occurs with the floating material working as a nucleus. In other words, a deposition reaction of zinc phosphate or manganese phosphate proceeds as a counter reaction to a reaction in which the floating material erodes.

It is necessary for the chemical conversion treatment liquid to be non-equilibrated by a potassium ion from potassium tetraborate so that the floating material is formed in the liquid. Namely, potassium tetraborate works as a trigger of formation of a floating material.

Accordingly, the chemical conversion treatment liquid according to the present invention must contain potassium tetraborate.

In addition, when a fluorine ion is contained in the chemical conversion treatment liquid, a potassium ion from potassium tetraborate reacts with a

fluorine ion. Because of this reaction, potassium tetraborate cannot perform the above-described function. Therefore, the chemical conversion treatment liquid according to the present invention must be substantially free of fluorine ions so that a floating material is formed in the liquid. Accordingly, the chemical conversion treatment liquid according to the present invention must be substantially free of fluorine ions.

The composition of a steel member is also an important factor for forming the floating material.

When a chemical conversion treatment liquid containing potassium tetraborate contacts a steel substrate which has a Cr content which is too low and which hence has a surface which is not covered with the oxide of chromium, an erosion reaction of the steel substrate rapidly occurs. Then a deposition reaction of zinc phosphate or manganese phosphate also rapidly occurs as a counter reaction to the above-described erosion reaction before potassium tetraborate non-equilibrates the chemical conversion treatment liquid.

Therefore, when a steel substrate does not contain 0.5-13% of Cr, a floating material is not formed in a chemical conversion treatment liquid and hence the phenomenon according to the present invention does not occur.

Accordingly, it is essential that a steel composition according to the present invention contains 0.5-13% of Cr.

The acid number and the ratio of the total acid number to the free acid number in claim 8 are directly related to the formation of the floating material.

In the present invention, deposition of zinc phosphate or manganese phosphate occurs as a counter reaction to erosion of a floating material. This erosion-deposition reaction system of the present invention is different from the reaction system of a conventional chemical conversion treatment liquid in which a phosphate directly deposits as a counter reaction to erosion of a steel substrate.

The features of the acid number in claim 8 are specified so that the reaction system of the present invention becomes effective. Therefore, these features are intrinsically different from features which are determined so that the reaction system of a conventional chemical conversion treatment liquid becomes effective. Thus, even if the features of the acid number of the present invention overlap conventional features of the acid number, there is no relationship between the features.

ARGUMENTS

Applicants submit that there are a number of flaws in the rejection that requires its withdrawal. These arguments are set out below under the appropriate headings.

Otrhalek

Otrhalek discloses applying an ultrasonic wave during the formation of a chemical conversion film. As admitted by the Examiner, Otrhalek does not disclose that a potassium ion is contained in a chemical conversion treatment liquid or that an oil well pipe formed of a Cr containing steel substrate is subjected to chemical conversion treatment.

In addition, Otrhalek does not teach or suggest adding potassium tetraborate to a chemical conversion treatment liquid. Therefore, Otrhalek is completely silent about a phenomenon which occurs when a chemical conversion treatment liquid containing potassium tetraborate contacts a Cr containing steel substrate, and which is the most important phenomenon for the present invention. Therefore, these features are not found in Otrhalek and Otrhalek cannot obviate the invention.

One error in the rejection is the Examiner's assumption that the free acid and total acid contents and/ranges are overlapped with Otrhalek such that the claimed values are obvious. This is error for the simple reason that the reaction system for forming a chemical conversion film of Otrhalek is totally different from the reaction system for forming a chemical conversion film of the present invention. As pointed out above, Otrhalek does not coat the claimed Cr steel nor use potassium in the chemical conversion liquid. Thus, how can it be that the FAP and TAP of Otrhalek can be applied to a process that uses a different starting material and a different composition of a chemical conversion liquid? While Otrhalek teaches specific ranges, how can these ranges apply to a modified process? Given the fundamental difference between Otrhalek and the invention, the fact that there is some overlap regarding acid content is not determinative of the obviousness of this aspect of the method of claim 8. The rejection does not address how the FAP or TAP should be controlled when the method of Otrhalek is modified according to each of Boulos and Yauchi and this alone means that the rejection cannot be maintained. Therefore, the subject matter set forth in claim 8 cannot be obvious because of just this overlap.

Boulos

Boulos discloses a composition and a method for depositing a chemical conversion film containing a phosphate including manganese. However, Boulos does not teach or suggest containing potassium tetraborate in a chemical conversion treatment liquid, which is an essential feature of the present invention. Therefore, the subject matter set forth in amended claim 8 cannot be obvious with respect to Boulos.

Boulos does disclose a chemical conversion treatment liquid containing a potassium ion. However, Boulos teaches in column 8, lines 57-61 that a potassium ion is added for adjusting the pH of a chemical conversion treatment liquid and that a potassium ion and hence a sodium ion are equivalents. This teaching is opposite to the present invention. As described on page 6, line 31 to page 7, line 5 of the present specification, a sodium ion cannot be equivalent to a potassium ion in the present invention. Therefore, Boulos teaches away from the technical significance of the present invention in light of the function of a sodium ion in a chemical conversion treatment liquid.

Concerning the optionality of the use of fluoride, it is Applicants' contention that, if anything, Boulos teaches that fluoride is a desirable element. In the rejection, the Examiner states in that the addition of fluoride is optional in Boulos. Indeed there is the term "Optional fluoride component" in the first sentence of column 8, lines 3-25 of Boulos. However, the sentence can read "Optional fluoride component (G) is normally preferred in compositions according to the invention, because it has at least three

beneficial possible functions". Furthermore, there is a description on column 8, lines 12-13 that "as is often necessary for the phosphating process to work."

Based on these descriptions, a person skilled in the art who referred to Boulos would learn that a fluoride is substantially necessary for the phosphating process. This teaching is opposite to the present invention. Therefore, Boulos teaches away from the present invention in light of the function of a fluorine ion in a chemical conversion treatment liquid. Thus, one would not exclude fluoride in the method of Otrhalek and this feature of the invention is missing.

Yauchi

Yauchi does not disclose anything about chemical conversion treatment except one description. That is, Yauchi discloses in column 1, lines 57-65 that "the conventional chemical forming process does not prevent the occurrence of galling in the oil well joint made of a high alloy steel such as one containing 10% or more by weight of Cr". This description teaches that chemical conversion treatment does not work when a steel substrate contains a certain amount of Cr.

Therefore, it is difficult for a person skilled in the art based on Yauchi to conceive of the technical feature of the present invention in which a proper chemical conversion film is formed via a floating material formed by potassium tetraborate.

If anything, Yauchi is representative of the prior art of the patent application and the well known problem of trying to coat 0.5 to 13% Cr steel pipes due to the presence of the oxide coating formed thereon. If anything, one of skill in the art

would take the teachings of Yauchi and consider them to be a teaching away of trying to apply a chemical conversion film to high Cr steel pipe.

Accordingly, the present invention is not obvious with respect to Yauchi.

Otrhalek, Boulos, and Yauchi

Applicants also argue that the reasoning for the modification of Otrhalek is flawed and this is another reason why a prima facie case of obviousness is not established.

Since the technical significance of Otrhalek is to apply an ultrasonic wave during chemical conversion treatment, a person skilled in the art learns from Otrhalek that an ultrasonic wave should be applied during chemical conversion treatment if a proper chemical conversion film is required. Therefore, it is difficult for a person skilled in the art who tries to conceive of an invention based on Otrhalek to consider that an advantageous effect is obtained without applying an ultrasonic wave during chemical conversion treatment.

However, claim 8 does not contain the feature of applying an ultrasonic wave during chemical conversion treatment. Therefore, in order for a person skilled in the art to conceive of the present invention based on Otrhalek, he would have to ignore the teaching of Otrhalek and believe that an advantageous effect could be obtained without applying an ultrasonic wave during chemical conversion treatment.

Accordingly, it is not easy for a person skilled in the art to conceive of the present invention based on Otrhalek as the primary reference.

Potassium Tetraborate

Claim 8 now requires the presence of potassium tetraborate in the chemical conversion liquid. So, one question of patentability is whether Otrhalek, Boulos, and Yauchi teach the claimed method with the claimed potassium compound.

None of these references teach or suggest the use of this compound. At best, Boulos teaches potassium hydroxide, which is only for pH adjustment. There is nothing in any of the prior art to teach the feature of potassium tetraborate which is essential for the subject matter of claim 8. In addition, Otrhalek, Boulos, and Yauchi are totally silent about a floating material which is formed in a chemical conversion treatment liquid because of the existence of potassium tetraborate in this liquid.

There is also no reason for the Examiner to say that one of skill in the art would find it obvious to use potassium tetraborate in place of the potassium oxide suggested for pH control in the prior art. Why choose this compound from an unlimited number of choices? Making a rejection of this nature is an improper "obvious to try approach", when there is insufficient guidance from the prior art to arrive at potassium tetraborate.

Therefore, a person skilled in the art cannot conceive of the subject matter of claim 8 based on the teachings of Otrhalek, Boulos, and Yauchi. Accordingly, the subject matter set forth in claim 8 is non-obvious with respect to Otrhalek, Boulos and Yauchi.

Donofrio

In the second rejection, Donofrio is used in place of Boulos to allege that the use of potassium in Otrhalek is obvious.

Donofrio discloses a chemical conversion treatment liquid containing a zinc ion, a nickel ion, and orthophosphoric acid. However, Donofrio does not teach or suggest using **potassium tetraborate** in a chemical conversion treatment liquid, which is an essential feature for the present invention. Therefore, the subject matter set forth in amended claim 8 cannot be obvious with respect to Donofrio.

Indeed, Donofrio discloses on column 3, lines 58-62, a chemical conversion treatment liquid containing a potassium ion. However, Donofrio teaches in this description that an alkali metal hydroxide is used for adjusting the pH of a chemical conversion treatment liquid and hence a potassium ion and a sodium ion are equivalents. Since a floating material is not formed in a chemical conversion treatment liquid when this liquid contains a sodium ion, this teaching of Donofrio is opposite to the present invention (see the remarks above about the non-equivalency of sodium and potassium in the context of the invention). Therefore, Donofrio teaches away from the present invention in light of the function of a sodium ion in a chemical conversion treatment liquid. Accordingly, the present invention is non-obvious with respect to Donofrio.

Otrhalek, Donofrio, and Yauchi

The combination of references fails for the same reasons as set forth above for Otrhalek, Boulos, and Yauchi. That is, none of these references teach the use of potassium tetraborate and are silent regarding the floating material, which is formed in a chemical conversion treatment liquid because of the existence of the potassium tetraborate.

JP '956

JP '956 teaches a method of forming a chemical conversion film on a steel substrate containing Cr. In this method, the total acid number of a chemical conversion treatment liquid is increased to be at least 55 so as to promote a reaction of eroding the steel substrate, and thereby a deposition reaction of forming a chemical conversion film is promoted, which reaction occurs as a counter reaction to the erosion reaction of the steel substrate.

According to the teaching of JP '956, a chemical conversion film may be formed on a steel substrate containing Cr. However, the formed chemical conversion film will have lack of hiding, i.e., the substrate can be exposed. Since the technical means for resolving the object of JP '956 is to increase the acid number of a chemical conversion treatment liquid so that an oxide on the substrate which is hard to be eroded can be eroded, an erosion reaction occurring on the surface of the substrate is apt to lose uniformity. Therefore, a deposition reaction as a counter reaction of the erosion reaction cannot uniformly occur on the surface of a steel substrate containing Cr, thus the lack of hiding.

In contrast, a chemical conversion film is formed on a Cr-containing steel substrate via deposition of a floating material on the surface of the substrate in the present invention. Because of this floating material on the surface of the substrate, a proper chemical conversion film can be formed on a Cr-containing steel substrate even when a chemical conversion treatment liquid is relatively moderate, namely, when the acid number is not high.

Therefore, the present invention has an advantageous effect compared to JP '956 such that a proper chemical conversion film is formed from a relatively moderate chemical conversion treatment liquid. As explained above, one key feature relevant to this advantageous effect of the present invention is potassium tetraborate contained in a chemical conversion treatment liquid. Since JP '956 is completely silent about this feature, it is impossible for a person skilled in the art to conceive of the present invention based on JP '956.

In addition, JP '956 teaches in paragraph [0020] that a fluorine ion is preferably contained as an etchant. As explained above, JP '956 resolves its object by enhancing an erosion reaction of a steel substrate to enhance a deposition reaction. Therefore, the feature of adding a fluorine ion as an etchant is directly related to the technical significance of JP '956, and hence a person skilled in the art will learn from JP '956 to add a fluorine ion. In other words, the person skilled in the art who refers to JP '956 learns that a chemical conversion treatment liquid free of a fluorine ion is inferior to a chemical conversion treatment liquid containing a fluorine ion in forming a chemical conversion film on a steel substrate containing Cr. Therefore, JP '956 teaches away from the present invention in light of the function of a fluorine ion.

JP '956 and Boulos

The rejection based on JP '956 and Boulos fails for the same reason as set out above. The Examiner states in the rejection that it would have been obvious to one of ordinary skill in the art to have incorporated potassium hydroxide as taught by Boulos into the coating solution of JP '956 in order to adjust and control the free and total

acid content as taught by Boulos, and that the free acid, the total acid and the ratio of total acid to free acid in the coating solution of JP '956 in view of Boulos overlap the claimed free acid, total acid, and total acid/free acid ratio ranges.

However, JP '956 and Boulos do not teach or suggest the feature of potassium tetraborate which is essential for the subject matter of claim 8. In addition, JP '956 and Boulos are totally silent about a floating material which is formed in a chemical conversion treatment liquid because of the existence of potassium tetraborate in this liquid. Therefore, a person skilled in the art cannot conceive of the subject matter of claim 8 based on the teachings of JP '956 and Boulos. Accordingly, the subject matter set forth in claim 8 is non-obvious with respect to JP '956 and Boulos.

Rebuttal of Allegation of Obviousness

Applicants also submit that the solving of the problem discussed above concerning the difficulties in coating high Cr steel pipe is one that is deserving of patent protection. That is, the Applicants have been able to effectively coat a threaded joint that others in the art have been previously unable to do. This methodology is reflected in the claims by the requirement of the chemical conversion liquid, the type of steel, the absence of fluoride, the presence of potassium tetraborate, the total acid number, and the claimed ratio. The result of practicing the method of claim 8 is truly unexpected and patentable.

SUMMARY

In light of the above, the rejections based primarily on Otrhalek or JP '956 are no longer appropriate and a prima facie case of obviousness is not established.

Therefore, the Examiner is respectfully requested to examine this application and pass all pending claims onto issuance.

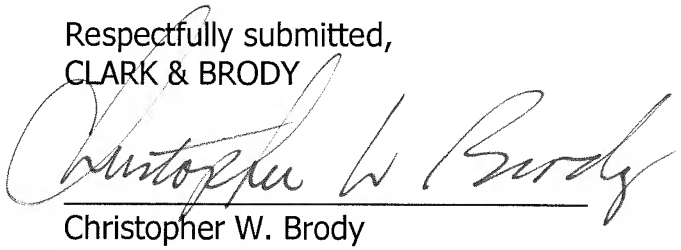
If the Examiner believes that an interview would be helpful in expediting the allowance of this application, the Examiner is requested to telephone the undersigned at 202-835-1753.

Again, reconsideration and allowance of this application is respectfully requested.

A petition for a two-month extension of time is made. Please charge Deposit Account No. 50-1088 the amount of $490.00 to cover the cost of the extension of time.

Please charge any fee deficiency or credit any overpayment to Deposit Account No. 50-1088.

Respectfully submitted,
CLARK & BRODY



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